TITLE

NETWORK SYSTEM AND METHOD OF CONTROLLING THE SAME

CLAIM OF PRIORITY

[0001]   This application makes reference to, incorporates the same herein, and claims all benefits accruing under 35 U.S.C. §119 from my application *NETWORK SYSTEM AND CONTROLLING METHOD THEREOF* filed with the Korean Industrial Property Office on 20 November 2000 and there duly assigned Serial No. 69102/2000.

BACKGROUND OF THE INVENTION

Technical Field

[0002]   . The present invention relates to a network system and a method of controlling the same. More particularly, the invention relates to a network system, and a method of controlling the same, wherein variable Internet protocol (IP) addresses of network units are viewed as fixed IP addresses.

Related Art

[0003]   All network units (for example, host computers, routers, set-top boxes, etc.) connected to the Internet generally have unique transmission control protocol/Internet protocol (TCP/IP) addresses which enable the corresponding network units to access other network units located in all parts of the world so as to utilize Internet services.

1   **[0004]**   The TCP/IP is an aggregate of two protocols, a transmission control protocol and an

2   Internet protocol, which supports the exchange of data between different network units.

3   Software modules employing the TCP/IP are required for the connection of network units to the

4   Internet. These software modules may be, for example, Internet Explorer, Netscape, *etc*. The

5   TCP/IP is currently adopted as a standard protocol of the Internet, and its address, or IP address,

6   is typically composed of four parts, each being a numeral (for example, 211.203.81.245), for

7   identifying a corresponding communication netwo rk or network unit. Different Internet IP

8   addresses are assigned to network units connected to the Internet throughout the world, and are

9   managed by a network information center (NIC).

10   **[0005]**   Such IP addresses of network units may generally be classified into two types: a fixed

11   IP address and a variable IP address. The fixed IP address, owing to its unchangeability, is

12   preferred to enable a user to access a corresponding network unit by entering it at any place, but

13   it is disadvantageous in that an operator of the network unit has to pay an IP company a high rate

14   for using it.

15   **[0006]**   As compared with the fixed IP address, the variable IP address is assigned by a

16   dynamic host configuration protocol (DHCP) server in such a manner that it is permitted to be

17   used only for a predetermined period of time. In this regard, a network unit employing such a

18   variable IP address must be again assigned a valid IP address from the DHCP server after the

19   predetermined period of time elapses. This variable IP address is disadvantageous in that it is

20   variable, but it has the advantage that an operator of the network unit can utilize the Internet at a

21   lower rate as compared to the higher rate of the fixed IP address.

1   [0007]   If a network unit employs a variable IP address, a user will have to recognize the

2   variable IP address to gain access to the network unit. However, the user has no way of

3   recognizing the variable IP address because the DHCP server selects any one of numerous valid

4   IP addresses held therein randomly as the variable IP address, and then assigns it to the network

5   unit. As a result, the user cannot access the network unit because he or she cannot recognize the

6   variable IP address. Consequently, an operator of the network unit is obliged to employ the high-

7   cost fixed IP address.

8   [0008]   The following are considered to be generally relevant to the present invention but are

9   burdened by the disadvantages set forth above: Korean Patent Publication No. 12264/2000 to

10   Byung-Jin Lim, entitled *SERVER CONNECTING METHOD AND SYSTEM FOR DYNAMIC IP*

11   *ADDRESS*, published on March 6, 2000, Korean Patent Publication No. 41829/2000 to Sun-Hui

12   Kim *et al.*, entitled *PRIVATE IP ADDRESS OPERATING APPARATUS IN MULTI-MEDIA*

13   *SATELLITE TELECOMMUNICATION SYSTEM*, published on July 15, 2000, U.S. Patent No.

14   6,012,088 to Li *et al.*, entitled *AUTOMATIC CONFIGURATION FOR INTERNET ACCESS*

15   *DEVICE*, issued on January 4, 2000, U.S. Patent No. 6,052,725 to McCann *et al.*, entitled *NON-*

16   *LOCAL DYNAMIC INTERNET PROTOCOL ADDRESSING SYSTEM AND METHOD*, issued

17   on April 18, 2000, and U.S. Patent No. 6,128,664 to Yanagidate *et al.*, entitled *ADDRESS-*

18   *TRANSLATING CONNECTION DEVICE*, issued on October 3, 2000.

19   **SUMMARY OF THE INVENTION**

20   [0009]   The present invention has been developed in view of the above problems, and it is an

1   object of the present invention to provide a network system, and a method of controlling the

2   same, wherein variable IP addresses of network units are recognized as fixed IP addresses.

3   **[0010]** In accordance with one aspect of the present invention, the above and other objects can

4   be accomplished by the provision of a network system comprising: at least one network unit

5   having a variable Internet protocol (IP) address and unique identification information; and an

6   agent server, including a database for receiving and storing the variable IP address and unique

7   identification information from the network unit, and a control unit for receiving the unique

8   identification information of the network unit from a user over a network, for searching the

9   database for the variable IP address of the network unit on the basis of the received unique

10   identification information, and for enabling the user to gain access to the network unit in

11   accordance with the searched result.

12   **[0011]** Preferably, the agent server further includes a communication unit for receiving the

13   unique identification information and variable IP address from the network unit, and for

14   transferring them to the database.

15   **[0012]** Preferably, the unique identification information may include at least one of an

16   Ethernet address of the network unit, an identifier of the network unit, and a search keyword for

17   the variable IP address of the network unit.

18   **[0013]** More preferably, the control unit receives at least one of the Ethernet address, the

19   identifier and the search keyword from the user over the network, compares it with data stored in

20   the database, and searches for the variable IP address if the comparison produces a match. The

21   data stored in the database may be updated at regular time intervals.

1   **[0014]** In accordance with another aspect of the present invention, there is provided a method

2   of controlling a network system having an agent server and at least one network unit, the method

3   comprising the steps of: (a) storing unique identification information and a variable IP address of

4   the network unit in a database in the agent server; (b) receiving the unique identification

5   information of the network unit from a user over a network, comparing it with the unique

6   identification information stored in the database, and searching for the variable IP address of the

7   network unit if the comparison produces a match; and (c) connecting the user to the network unit

8   having the searched variable IP address.

9   **[0015]** Preferably, the method further comprises the step of receiving the unique identification

10   information and variable IP address of the network unit, and transferring them to the database in

11   the agent server.

12   **[0016]** Preferably, the unique identification information includes at least one of an Ethernet

13   address of the network unit, an identifier of the network unit, and a search keyword for the

14   variable IP address of the network unit.

15   **[0017]** More preferably, the above step (b) includes the step of receiving at least one of the

16   Ethernet address, the identifier and the search keyword from the user over the network,

17   comparing it with data stored in the database, and searching for the variable IP address if the

18   comparison produces a match. The data stored in the database may be updated at regular time

19   intervals.

1 **BRIEF DESCRIPTION OF THE DRAWINGS**

2 **[0018]** A more complete appreciation of the invention, and many of the attendant advantages,

3 thereof, will be readily apparent as the same becomes better understood by reference to the

4 following detailed description when considered in conjunction with the accompanying drawings

5 in which like reference symbols indicate the same or similar components, and wherein:

6 **[0019]** Fig. 1 is a view schematically showing the construction of a network system in

7 accordance with the present invention;

8 **[0020]** Fig. 2 is a block diagram showing in detail the construction of the network system in

9 accordance with the present invention;

10 **[0021]** Fig. 3 is a flowchart illustrating a procedure for storing information of a network unit in

11 an agent server in accordance with the present invention;

12 **[0022]** Fig. 4 is a flowchart illustrating a procedure for connecting a user to the network unit in

13 accordance with the present invention; and

14 **[0023]** Fig. 5 is a view showing a screen configuration of the network system in accordance

15 with the present invention.

16 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

17 **[0024]** Fig. 1 is a view schematically showing the construction of a network system in

18 accordance with the present invention, and Fig. 2 is a block diagram showing in detail the

19 construction of the network system in accordance with the present invention. As shown in these

20 drawings, the present network system comprises: an Internet video server 50, which is a network

1   unit employing a variable IP address, and which is equipped with a local area network (LAN)

2   card 60; and an agent server 10, including a database 30 for storing the variable IP address of the

3   Internet video server 50 and a unique number, or an Ethernet address, of the LAN card 60 of the

4   server 50. The agent server 10 further includes a control unit 40 for searching the database 30 for

5   the variable IP address of the Internet video server 50 on the basis of the Ethernet address of the

6   server 50 entered through a user personal computer (PC) 95, and for connecting the user PC 95 to

7   the server 50 having the searched variable IP address.

8   [0025]   It should be noted that the Internet video server 50 is taken as an example of the

9   network unit for the convenience of description, and the network unit may be a host computer, a

10   router or other Internet accessible unit equipped with the LAN card 60, besides the Internet video

11   server 50.

12   [0026]   The Internet video server 50 is, preferably, a video compression transmission unit with

13   a Web server and TCP/IP. A user can gain access to the server 50 using a Web browser of his or

14   her own PC at a remote site.

15   [0027]   The server 50 is assigned a variable IP address from a dynamic host configuration

16   protocol (DHCP) server 90. The LAN card 60 has a unique 48-bit Ethernet address, as is

17   typically assigned to every network unit. The 24 bits in the latter half of the 48 bits of the

18   Ethernet address are stored in the database 30 of the agent server 10, as will be described later in

19   detail, such that they are used to identify a corresponding network unit.

20   [0028]   The Internet video server 50 has a connection terminal 70 for a video camera 75 or

21   monitor 72. The server 50 can output a video signal to the monitor 72 through the connection

1   terminal 70 or can receive a video signal from the video camera 75 through the connection

2   terminal 70, and can compress the received video signal and transmit the compressed video

3   signal over the Internet.

4   **[0029]**   The server 50 further includes an Internet video server controller 80 for processing a

5   service request from a Web browser, and for transferring the latter-half 24 bits of the Ethernet

6   address and the variable IP address of the server 50 to the database 30 of the agent server 10, as

7   will be described later in detail.

8   **[0030]**   The agent server 10 includes a communication unit 20 for receiving the Ethernet

9   address and variable IP address transferred from the Internet video server 50. The database 30 is

10   provided in the agent server 10 to store the Ethernet address and the variable IP address of the

11   Internet video server 50 received through the communication unit 20. The control unit 40 is

12   provided in the agent server 10 to search the database 30 for the variable IP address of the

13   Internet video server 50 on the basis of the Ethernet address of the server 50 entered through a

14   user PC 95, and to connect the user PC 95 to the server 50 having the searched variable IP

15   address.

16   **[0031]**   The communication unit 20 preferably includes a receiver (not shown) for receiving the

17   Ethernet address and the variable IP address of the Internet video server 50, and a transmitter (not

18   shown) for transmitting the results of the search conducted by the control unit 40 to the user PC

19   95. With this construction, the communication unit 20 acts to transfer the Ethernet address and

20   the variable IP address from the Internet video server 50 to the database 30.

21   **[0032]**   The database 30 acts to store the Ethernet address assigned to the network unit (that is,

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1   the LAN card 60 of the Internet video server 50, the variable IP address assigned from the DHCP

2   server 90 to the server 50) and an identifier corresponding one-to-one to the Ethernet address.

3   When the Internet video server 50 is powered on, then the variable IP address, the Ethernet

4   address and the identifier are transferred from the Internet video server controller 80 to the

5   communication unit 20, and are in turn stored in the database 30. The data stored in the database

6   30 is updated at regular time intervals.

7   **[0033]**   The database 30 is further adapted to store keywords for a keyword search operation.

8   When a user selects a desired keyword, the keyword search operation is performed on the basis

9   of the selected keyword to connect the user to a network unit associated with that keyword

10   according to the searched result even though the user does not recognize an Ethernet address and

11   identifier of the network unit.

12   **[0034]**   The Ethernet address of the Internet video server 50 is generally expressed in

13   hexadecimal 48 bits as in Table 1 below, and only the latter-half 24 bits thereof are stored in the

14   database 30 in the present embodiment. Also, the variable IP address of the Internet video server

15   50 is typically composed of four parts, each being a numeral. For example, the variable IP

16   address and the Ethernet address may be expressed as 211.144.88.99 and 0000f0ffa101,

17   respectively.

18   **[0035]**   In this case, the variable IP address, the Ethernet address and the identifier of the

19   Internet video server 50 may be stored in the database 30 as in the following Table 1.

<Table 1>

DATABASE	VARIABLE IP ADDRESS	ETHERNET ADDRESS	IDENTIFIER
1	211.144.88.95	Ffa101	camera1
2	211.144.88.96	ffa102	camera2
3	211.144.88.97	ffa103	camera3
4	211.144.88.98	ffa104	camera4

[0036]   As stated previously, the control unit 40 is provided in the agent server 10 to search the database 30 for the variable IP address of the Internet video server 50 on the basis of the Ethernet address of the server 50 entered through a user PC 95, and to connect the user PC 95 to the server 50 having the searched variable IP address.

[0037]   A description will hereinafter be given of a method of operating the network system with the above-described construction in accordance with the present invention with reference to Figs. 3 and 4 and the Table 1 above.

[0038]   Fig. 3 is a flowchart illustrating a procedure for storing information of the Internet video server 50 in the agent server 10 in accordance with the present invention. First, when the Internet video server 50 is powered on, it requests the nearest DHCP server 50, using a DHCP protocol, to assign a variable IP address thereto (S10). In response to the variable IP address assignment request from the Internet video server 50, the DHCP server 90 selects any one of numerous valid variable IP addresses in its variable IP address pool, and transfers the selected variable IP address to the server 50 (S20). Then, the Internet video server 50 receives the variable IP address (211.144.88.95) from the DHCP server 90, and employs it for a

1   predetermined period of time.

2   **[0039]**   Thereafter, the Internet video server controller 80 in the server 50 sends an Ethernet

3   address (ffa101) assigned to the LAN card 60 in the server 50, the variable IP address

4   (211.144.88.95) assigned by the DHCP server 90, and a self-identifier (camera1) of the server 50

5   to the communication unit 20 in the agent server 10 via the LAN card 60 (S30). Upon receiving

6   the variable IP address, the Ethernet address and the identifier from the Internet video server

7   controller 80, the communication unit 20 stores them in the database 30 in the agent server 10

8   (S40).

9   **[0040]**   Fig. 4 is a flowchart illustrating a procedure of connecting a user PC 95 to the Internet

10   video server 50 employing the variable IP address in accordance with the present invention.

11   First, the user gains access to the agent server 10 through a Web browser of the user PC 95, and

12   sequentially enters an IP address or uniform resource locator (URL) address of the agent server

13   10, and the latter-half 24 bits of an Ethernet address assigned to the server 50 or a self-identifier

14   of the server 50, corresponding to the Ethernet address (S100).

15   **[0041]**   Example: http://IP_server/camera.cgi? ffa101

16   **[0042]**   Thereafter, the control unit 40 in the agent server 10 runs a camera.cgi program therein

17   to compare the data entered by the user with data stored in the database 30, searches the database

18   30 for a variable IP address (211.144.88.95) associated with the entered data if the comparison is

19   a match, and connects the user PC 95 to the network unit or server 50 using the searched variable

20   IP address (S120). The camera.cgi program is a type of common gateway interface program, and

21   is run in the agent server 10 to input the data ffa101 following the "?" in the "camera.cgi?

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1 ffa101" portion of the data (http://IP_server/camera.cgi? ffa101) entered through the Web

2 browser by the user and to search the database 30 for a variable IP address associated with the

3 inputted data.

4 **[0043]** On the other hand, in the above step S100, the user PC 95 may not be able to recognize

5 the Ethernet address or identifier of the Internet video server 50. In this case, the user can access

6 the Internet video server 50 by entering a CGI search keyword (camera.cgi) using the user PC 95,

7 as shown in Fig. 5. Namely, as shown in Fig. 5, the user enters the CGI keyword (camera.cgi)

8 next to the IP address or URL address of the agent server 10 through the user PC 50 in order to

9 search for the variable IP address of the desired network unit or Internet video server 50.

10 **[0044]** Example: http://IP_server/camera.cgi or http://203.14.5.1/camera.cgi

11 **[0045]** Then, the control unit 40 in the agent server 10 searches the database 30 for variable IP

12 addresses of network units which match the entered CGI keyword, and outputs a list of the

13 searched variable IP addresses, as shown in Fig. 5, so that the user can gain access to a desired

14 one of the network units.

15 **[0046]** It should be noted that the Internet video server 50 has been taken as an example of the

16 network unit for the convenience of description. This invention is similarly applicable to

17 computers, routers and other Internet accessible units equipped with LAN cards and having

18 variable IP addresses.

19 **[0047]** As described above, the database 30 and control unit 40 are provided in the agent

20 server 10 in order to store variable IP addresses and Ethernet addresses and search for the

21 variable IP addresses on the basis of the Ethernet addresses. As a result, users are readily able to

1   access desired network units, even if the units employ variable IP addresses.

2   **[0048]**   As is apparent from the above description, the present invention provides a network

3   system, and a method of controlling the same, wherein variable IP addresses of network units can

4   be recognized as fixed IP addresses.

5   **[0049]**   Although the preferred embodiments of the present invention have been disclosed for

6   illustrative purposes, those skilled in the art will appreciate that various modifications, additions

7   and substitutions are possible without departing from the scope and spirit of the invention as

8   recited in the accompanying claims.